

Unlocking the Mysteries of the Mantle: High Silica Rocks from the Central Mexican Volcanic Belt and What They Tell us About the Formation of Continental Crust

Maggie Sochko¹, Rose Ramirez², Susanne Straub³, Louise Bolge³

1. *Department of Earth and Environmental Sciences, Rensselaer Polytechnic Institute, Troy, NY 12180*
2. *Columbia University New York, NY*
3. *Lamont-Doherty Earth Observatory at the Columbia University, 61 Route 9W, Palisades, NY 10964*

Processes that occur during the formation of magmas at convergent margins remain unclear because of the destruction of mantle signatures through interactions with overlying continental crust. In order to understand these processes, two volcanoes from the central Mexican Volcanic Belt (MVB), Popocatepetl and Nevado de Toluca, were analyzed for composition. The magmas found here range from basaltic to dacitic compositions (52.7-67.9 wt% SiO₂, Mg# = 49-73) and show major element oxides consistent with an arc magma. Oxygen isotope values taken from olivine and plagioclase phenocrysts support silica input by a crustal component. High ³He/⁴He ratios = 7-8 of olivine phenocrysts suggest a melt origin from the mantle that has been infiltrated by a crustal component from the subducted slab. These results are consistent with the pyroxenite model, where slab components react with existing mantle peridotite to form pyroxenite veins locally. Upon melting, these pyroxenites form partial basaltic-dacitic melts with high Mg#s. The high Mg# >70 of the initial melts with a high silica (>55 wt%) suggests that the low-Mg erupted melts reflect a loss of olivine due to moderate fractional crystallization in the overlying crust. Using the pyroxenite model, we assume that major elements Mg, Fe, Ca, Ti, and Mn are mantle derived and major elements Si, K, Na, Al, and P receive input from the subducted slab. Because these andesites are so similar to the continental crust compositionally, we can suggest using this model as a proxy for continental crust formation.